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Boomssloot 85 2h, NL-1011 CX Amsterdam (NL). DEN
TOONDER, Pieter, Martinus [NL/NL]; Lombardstraat
11, NL-3311 VL Dordrecht (NL).

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(74) Agent: LAND, Addick, Adrianus, Gosling; Arnold &
Siedsma, Sweelinckplein 1, NL-2517 GK The Hague (NL).

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(71) Applicant (*for all designated States except US*): EX'OVII-
SION B.V. [NL/NL]; Woudenbergseweg 41, NL-3711 AA
Austerlitz (NL).

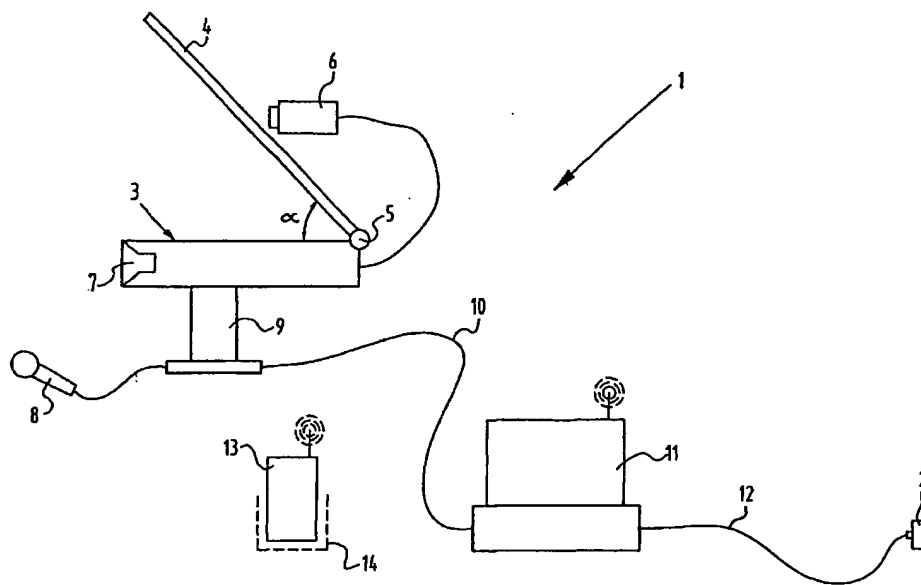
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(72) Inventors; and

(75) Inventors/Applicants (*for US only*): WINTZEN, Eckart,
Joachim [NL/NL]; Broekweg 4, NL-3972 MC Driebergen
(NL). KAPPETIJN, Frederick, Karel [NL/NL]; Recht

[Continued on next page]

(54) Title: VIDEOPHONE



(57) Abstract: The present invention provides a videophone for communication with eye contact by means of image and/or sound, comprising: -image recording means for recording images; -image reproducing means for reproducing an image recorded by another videophone; -sound recording means for recording sound; -sound reproducing means for reproducing sound recorded by another videophone; -operating means for operating the functions of the videophone; and videophone enhancing means for enhancing image and/or sound quality, convenience of operation and/or use.

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VIDEOPHONE

Despite the possibilities of video conferencing, great distances are still very frequently travelled, mainly in the business world but also in the private sphere, in order to have a more personal contact, this in spite of the increased danger of flying. Video conferencing equipment is generally considered unsatisfactory.

Known from for instance the American patent 5,777,665 is a videophone which can be placed on the desk of an executive and with which a reasonably good eye contact can be obtained with the person who also has such a videophone available. In a number of respects however this known videophone must be improved, for which purpose such a primitive and expensive device must approach perfect quality. Such aspects relate to for instance the positioning of the face in the image, the picture quality per se, easy operation of the diverse functions and/or the appearance of the device on the desk and the recorded image in relation to the surroundings.

The present invention therefore has for its object to improve the known videophone.

The present invention provides a videophone for communication with eye contact by means of image and/or sound, comprising:

- image recording means for recording images;
- image reproducing means for reproducing an image recorded by another videophone;
- sound recording means for recording sound;
- sound reproducing means for reproducing sound recorded by another videophone;
- operating means for operating the functions of the videophone; and

- videophone enhancing means for enhancing image and/or sound quality, convenience of operation and/or use.

Communication with eye contact is possible with a videophone according to the present invention, wherein
5 drawbacks of existing videophones are also obviated, an improved convenience of operation is provided and an enhanced image and/or sound quality.

In a preferred embodiment the videophone enhancing means comprise motor means for moving the reflection means and/or
10 the image reproducing means upward and/or downward for bringing to eye level an image reflected in the reflection means, so that eye contact is improved.

In a further preferred embodiment the videophone enhancing means comprise rotating means for rotating the reflection
15 means for the purpose of improving eye contact and enhancing convenience of use, wherein the rotating means comprise a motor which is arranged in a hinge connected to the image reproducing means and the reflection means for motorized rotation of the reflection means, for instance between a
20 closed position and an opened position wherein the angle between the reflection means and the image reproducing means can be chosen between 40° and 60°.

In a further preferred embodiment the videophone enhancing means comprise at least one light source which is arranged
25 lower than the image reproducing means for the purpose of lighting the face of a user. The recorded image of the face thereby comes across better on another videophone by eliminating shadows.

In a further preferred embodiment the operating means
30 comprise a remote control for remotely controlling the videophone via a wire or in wireless manner, thereby enhancing convenience of use.

In a further preferred embodiment the reflection means have a tapering form so that the reflection means are narrower on the underside thereof than on the top side in order to improve the perspective view of the reflected image.

5 In a further preferred embodiment the edge of the reflection means is at least partially transparent in order to create virtual presence of the reflected image.

According to a second aspect the present invention provides a method for manufacturing a videophone, comprising
10 the steps of:

- arranging at least partially transparent reflection means above image reproducing means in order to reflect the image reproduced by the image reproducing means;
- arranging image recording means behind the reflection
15 means;
- arranging sound recording means for recording sound;
- arranging sound reproducing means for reproducing sound recorded by another videophone;
- arranging operating means for operating the functions of
20 the videophone; and
- arranging videophone enhancing means for enhancing image and/or sound quality, convenience of operation and/or use.

Further advantages and features of the present invention will be elucidated in the following description of a preferred
25 embodiment thereof with reference to the annexed figures, in which:

- fig. 1 shows a schematic overview of a videophone according to the present invention in a first preferred embodiment;
- 30 - fig. 2 is a rear view in perspective of a part of the videophone of fig. 1 in a first state of use;
- fig. 3 is a front view in perspective of the part of the videophone of fig. 2 in a first state of use;

- fig. 4 is a rear view in perspective of the part of the videophone of fig. 2 in a second state of use;

- fig. 5 is a front view in perspective of the part of the videophone of fig. 2 in a second state of use;

5 - fig. 6 shows an exploded perspective view of a part of the videophone according to the present invention in a first preferred embodiment;

10 - fig. 7 shows a perspective view of means for moving upward or downward the image reproducing means of the videophone of fig. 1 in a first preferred embodiment;

- fig. 8 is a cut-away view in perspective of a lowest part of the videophone of fig. 1 in a first preferred embodiment;

15 - fig. 9 is a view in perspective of the image reproducing means of the videophone of fig. 1 in a first preferred embodiment;

- fig. 10 is a cut-away view in perspective of rotating means of the videophone of fig. 1 in a first preferred embodiment;

20 - fig. 11 is a view in perspective of the image recording means of the videophone of fig. 1 in a first preferred embodiment;

25 - fig. 12 is a view in perspective of a unit for separate placing for the videophone of fig. 1 in a first preferred embodiment.

A videophone 1 according to the present invention makes it possible to communicate with eye contact (fig. 1). A picture signal received via a network 2, for instance a LAN or the internet, is displayed for this purpose by the screen 3, for instance an LCD with a light intensity in the order of 1000-
30 2000 Cd/m². The picture displayed by screen 3 is reflected in the partly light-transmitting mirror 4 described later, with a reflection/transmission ratio in the order of 50%/50%, wherein

the angle α between screen 3 and the partly light-transmitting mirror 4 lies between 40° and 60°. The partly light-transmitting mirror is connected via a hinge 5 to screen 3, wherein a motor is arranged in the hinge so that the angle α between screen 3 and mirror 4 can be adjusted using the motor. A user of the videophone sees the reflected image, while a camera 6 arranged behind mirror 4 records the image of the user through the partly light-transmitting mirror. This camera arrangement enables users to have eye contact so that a more penetrating contact is possible than in known systems for video conferencing. For sound reproduction of received sound signals a loudspeaker 7 is arranged on the front of the videophone, just below the partly light-transmitting mirror 4 and the image reflected therein. The sound produced thus comes from the direction of the reflected image, so that the most natural possible situation is created. A microphone 8 picks up the sounds from a user.

The embodiment shown in fig. 1 further comprises a base 9, described more extensively later, into which is incorporated a motor for moving upward or downward the screen 3, partly light-transmitting mirror 4 and camera 6, so that a user can bring the reflected image to a desired height using the motor so as to improve eye contact. Signals are transmitted from and to a separate enclosure 11 via a cable 10, which can optionally be replaced by a wireless connection to reduce the space taken up by the videophone 1 on a desk. Enclosure 11 comprises hardware and software programmed therein, for instance a codec for communication with network 2 via cable 12. Since enclosure 11 can be placed separately, it can be placed under a desk so that the occupied space on the desk is limited. Cable 12 is a so-called flat cable carrying both the picture and sound signals as well as the power supply signal of about 48 V. The connection for picture and sound signals to

the network can likewise be made in wireless manner, for instance in order to enhance the appearance of the videophone. In order to achieve the enhanced image and/or sound quality large quantities of data must be transmitted, for instance in 5 the order of magnitude of 0.5 to 2.5 Mbps (megabit per second). With future compression techniques these data speeds can be increased or decreased subject to the applications.

An external remote control 13, for instance a handheld computer with a touch screen, such as for instance a COMPAQ I- 10 pack, HP Jornada, Pocket PC or Palmtop with a foot 14 developed by applicant, (remotely) operates the videophone. The developed software makes it possible, among other things, to use the remote control for personalization and for display of status information.

15 Fig. 2 shows a part 20 of videophone 1 that is placed on a desk. The hood 22 of plastic covers the rear side of the partly light-transmitting mirror 4 to screen off light. One component of hood 22 is the camera cover 24, which is optionally of transparent plastic to make the camera movements 20 visible. A bellows (not shown) is in this case arranged round the camera to screen off light.

Fig. 3 shows the part 20 in an opened position of use. The fan shape of the partly light-transmitting mirror 4 is clearly shown, wherein it is narrower on the underside at hinge 5 than 25 on the top side in order to improve the perspective view of the reflected image and to create a more open view. The edge 26 is made transparent so that, through the absence of a clear outline frame, the reflected image appears to transpose into the room setting, thereby creating a sense of virtual 30 presence. The partly light-transmitting mirror 4 is of a transparent material, for instance glass or polycarbonate of 2-4 mm thick, to which a reflecting material is applied, for instance silver. This reflective surface is protected against

scratching, among other things, by a coating applied thereto of glass with a thickness of about 5-50 μm . The rear or non-visual side of the transparent material is roughened by for instance sandblasting or etching to eliminate second

5 reflections in the transparent material. Base 9 further has the later elucidated control buttons 28 and light source 30.

Fig. 4 and 5 show the part 20 in a closed state of use, wherein less space is taken up and the view is less obstructed, this being desirable if the videophone is not in
10 use. The motor arranged in hinge 5 opens or closes hood 22 after operation of keys 28 or remote control 13. In a preferred embodiment opening proceeds automatically up to an angle α of 40', whereafter a user can further adjust angle α between about 40' and 60'. This possibility of setting the
15 angle ensures that a user can assume a more informal posture, which is essential for a relaxed conversation. The hood can be further opened to an angle α of 90' for servicing purposes.

Fig. 6 shows the hood 22 over mirror 4 and the camera cover 24, with the plate 32. Plate 32, for instance of a
20 mixture of darker paint and plastic, is glued to the rear of the partly light-transmitting mirror 4 to exclude light. A recess 33 is arranged in plate 32 so that the camera (not shown) can be viewed therethrough. Casing 34 protects hinge 5. Screen 3 is covered with a frame 36 and received in the box 38
25 described below. Further components are the protective housing 40, the top 42 in which the box 38 is arranged with slots 43 to allow passage of sound from a loudspeaker (not shown). Situated thereunder is the protective base 44. Base 9
comprises an upper cap 46, a foot base 48, a control panel 50
30 and a female scart connection 52 to which a male scart plug 54 connects for transfer of signals.

Situated inside base 9 is a mechanism 70 for adjusting the height (fig. 7). Plate 72 is connected with screws (not shown)

to foot base 48. A motor 74 can be activated by operating keys 28 or remote control 13, so that toothed wheels (not shown) engage on gear rack 76, so that the plate 78 having screwed thereon the protective base and the further upper part of the videophone, including the screen and the partly light-transmitting mirror, is moved upward or downward along the guide beam 80 to bring a reflected image to eye level.

In addition to control keys 28, there is arranged a light source 30 in base 9 (fig. 8). Light source 30 consists of a number of LEDs 82, for instance 20, with a light intensity of about 60 Cd/m². The light therefrom is reflected upward through about 20' via a reflector 84 to light the face of a user, so that the recorded image thereof comes across better on another videophone by reducing shadows. LEDs 82 are screened by a cover 86 of transparent material, for instance plastic. The reflector and/or the LEDs can optionally be coloured for better lighting. There is also the possibility of dimming the LEDs to a desired light level.

Screen 3 is arranged in the box 38 (fig. 9) so that the screen can be easily replaced and in order to shield electromagnetic radiation. The light from screen 3 should leave the screen at a small angle, since a user otherwise sees the image reflected in the mirror as well as the image on the screen. For this purpose a foil for blocking lateral light incidence is arranged in or on the screen. Both methods suffice, although if the foil is arranged on the screen a coating of glass is arranged thereover with a thickness of about 5-50 µm to protect the foil against scratching. On the front side of box 38 is arranged a loudspeaker 90 and a knob 92 for adjusting the brightness of the screen. Situated on the rear side is a protrusion 94 with two threaded holes on which engages the motor for rotating the mirror.

Motor 100 is arranged in a tube 102 of hinge 5 in order to rotate the arm 104, which is mounted on cover plate 32 round the partially light-transmitting mirror 4, relative to the flattened rod 106 fastened with screws (not shown) to protrusion 94 (fig. 10). Tube 102 has for this purpose a slot-like recess 108 through which the arm 104 protrudes. Situated on arm 104 is a plug 110 for through-feed of signals and supply voltage.

Camera 6, for instance from Sony, comprises two motors 112 and 114, wherein motor 112 engages via a belt 116 onto the camera, so that the lens 118 can move upward or downward as well as to the left and right (fig. 11). A control module arranged in the separate enclosure 11 drives the motors 112 and 114 such that a user remains in the middle of the picture by causing the camera to follow all his/her movements.

The enclosure 11 for separate placing comprises an upper part 120 and a foot 122, for instance of plastic. Arranged in the enclosure, among other things, are modules for actuating the camera movement, for actuating the screen and the loudspeaker, for receiving sound signals from the microphone and for coding and decoding image and sound signals for information exchange via a network (codec). Any codec which is suitable for audio/video, for instance from Sony, Tandberg or Polycom, is suitable for the videophone according to the present invention. Fig. 12 further shows the flat cable 12 for the picture and sound signals and for the supply voltage with a scart connection 124.

A videophone according to the above described preferred embodiment has the possibility of making eye contact, wherein existing systems are also improved, for instance in relation to image and sound quality and convenience of use.

The present invention is not limited to the above described preferred embodiment thereof; the rights sought are

defined by the following claims, within the scope of which many modifications can be envisaged.

CLAIMS

1. Videophone for communication with eye contact by means
5 of image and/or sound, comprising:

- image recording means for recording images;
- image reproducing means for reproducing an image
recorded by another videophone;
- sound recording means for recording sound;
- 10 - sound reproducing means for reproducing sound recorded
by another videophone;
- operating means for operating the functions of the
videophone; and
- videophone enhancing means for enhancing image and/or
15 sound quality, convenience of operation and/or use.

2. Videophone as claimed in claim 1, further comprising at
least partially transparent reflection means for reflecting
the image reproduced by the image reproducing means.

3. Videophone as claimed in claim 1 or 2, wherein the
20 videophone enhancing means comprise motor means for moving the
reflection means and/or the image reproducing means upward
and/or downward for bringing to eye level an image reflected
in the reflection means.

4. Videophone as claimed in any of the claims 1-3, wherein
25 the videophone enhancing means comprise rotating means for
rotating the reflection means for the purpose of improving eye
contact and enhancing convenience of use, wherein the rotating
means comprise a motor which is arranged in a hinge connected
to the image reproducing means and the reflection means for
30 motorized rotation of the reflection means, for instance
between a closed position and an opened position wherein the
angle between the reflection means and the image reproducing
means can be chosen between 40° and 60°.

5. Videophone as claimed in any of the claims 1-4, wherein the videophone enhancing means comprise at least one light source which is arranged lower than the image reproducing means for the purpose of lighting the face of a user.

5 6. Videophone as claimed in claim 5, wherein the at least one light source comprises at least one cold light source for instance 20 LEDs with a light intensity of about 60 Cd/m².

7. Videophone as claimed in claim 6, wherein (coloured) reflector means are arranged lower than the LEDs for
10 reflecting the light upward over an angle of for instance 20°, and wherein the LEDs can be coloured and the light intensity thereof is adjustable.

8. Videophone as claimed in any of the claims 1-7, wherein the operating means comprise a remote control for remotely
15 controlling the videophone via a wire or in wireless manner.

9. Videophone as claimed in claim 8, wherein the remote control comprises a palmtop, such as for instance a COMPAQ I-pack, HP Jornada, pocket PC, palmtop or similar device, wherein the screen thereof is a so-called touch screen and is
20 used to operate the videophone.

10. Videophone as claimed in any of the claims 2-9, wherein the reflection means are narrower on the underside thereof than on the top side in order to improve the perspective view of the reflected image.

25 11. Videophone as claimed in any of the claims 2-10, wherein the reflection means comprise a panel of an optically transparent material, such as for instance glass or polycarbonate with a thickness of for instance 2-4 mm, wherein a reflecting layer is applied to the transparent material for
30 the reflecting action thereof in a reflection/transmission ratio of 30%/70% to 70%/30%, subject to the chosen image reproducing means and image recording means.

12. Videophone as claimed in claim 11, wherein the reflective layer of the reflection means is protected by a coating applied thereto of glass with a thickness in the order of 5-50 μm .

5 13. Videophone as claimed in any of the claims 2-12, wherein the edge of the reflection means is at least partially transparent in order to create virtual presence of the reflected image.

10 14. Videophone as claimed in claim 11 or 12, wherein the surface of the non-visual side of the panel is roughened, with the exception of a small area in the middle for viewing therethrough by the image recording means, by means of for instance sandblasting or etching, and wherein to the roughened rear surface of the panel a light-intercepting material is
15 applied, for instance black paint and/or glue, to prevent light incidence through the rear surface.

15. Videophone as claimed in any of the claims 1-14, wherein the image reproducing means comprise an LCD screen.

20 16. Videophone as claimed in claim 15, wherein means for adjusting the light incidence are arranged on or in the LCD so that the light coming from the LCD is blocked directly in the direction of a user.

25 17. Videophone as claimed in either of the claims 15 or 16, wherein extra lamps are arranged in the LCD to increase the brightness thereof to a light intensity of for instance 1000-2000 Cd/m^2 .

30 18. Videophone as claimed in claim 16, wherein a coating of glass is applied to the means arranged on the LCD for adjusting the light incidence in order to protect against scratching thereof.

19. Videophone as claimed in any of the claims 1-18, wherein the image recording means comprise a camera which co-

displaces with movements of a user in order to hold his or her face in the middle of a viewfinder.

20. Videophone as claimed in any of the claims 1-19,
5 wherein the sound reproducing means comprise a first loudspeaker and wherein a second loudspeaker can be arranged if conditions, such as noise, require this.

21. Videophone as claimed in claim 20, wherein the first loudspeaker is arranged lower than the reflection means such
10 that the sound thereof comes from the direction of the reflected image.

22. Videophone as claimed in any of the claims 1-21, further comprising a flat cable for supplying all required signals, such as for instance sound, image and power supply
15 signals.

23. Videophone as claimed in any of the claims 1-22, wherein the videophone also serves as terminal, for instance for displaying information services and help-desk functions.

24. Videophone as claimed in any of the claims 1-23,
20 wherein the sound reproducing means comprise a headphone.

25. Videophone as claimed in any of the claims 1-24, further comprising a unit for placing separately for arranging therein modules such as hardware, so that the picture telephone occupies less space on for instance a desk.

25 26. Videophone as claimed in claim 25, wherein the modules comprise a codec for transmitting and receiving via a wire or in wireless manner of signals to and from a network, wherein the videophone can actuate any codec for audio/video.

27. Videophone as claimed in any of the claims 1-26,
30 further comprising a cover arranged on the non-visual side of the reflection means to protect the image recording means, wherein the cover is at least partly transparent so that the movements of the image recording means can be monitored.

28. Method for manufacturing a videophone, comprising the steps of:

- arranging at least partially transparent reflection means above image reproducing means in order to reflect the image reproduced by the image reproducing means;
- arranging image recording means behind the reflection means;
- arranging sound recording means for recording sound;
- arranging sound reproducing means for reproducing sound recorded by another videophone;
- arranging operating means for operating the functions of the videophone; and
- arranging videophone enhancing means for enhancing image and/or sound quality, convenience of operation and/or use.

29. Method for manufacturing a videophone as claimed in claim 28, comprising the step of arranging means for moving the reflection means and/or the image reproducing means vertically upward and/or downward in order to bring to eye level an image reflected in the reflection means.

30. Method for manufacturing a videophone as claimed in claim 28 or 29, comprising the step of arranging rotating means for rotating the reflection means for the purpose of improving eye contact and enhancing convenience of use, wherein the rotating means comprise a motor which is arranged in a hinge connected to the image reproducing means and the reflection means for motorized rotation of the reflection means, for instance between a closed position and an opened position wherein the angle between the reflection means and the image reproducing means can be chosen between 40° and 60°.

31. Method for manufacturing a videophone as claimed in claim 28, 29 or 30, wherein the videophone enhancing means comprise at least one light source which is arranged lower

than the image reproducing means for the purpose of lighting the face of a user.

32. Method for manufacturing a videophone as claimed in claim 31, wherein the at least one light source is a LED, for instance 20 LEDs with a light intensity of about 60 Cd/m², also comprising the step of arranging (coloured) reflector means lower than the LEDs for reflecting light upward over an angle of for instance 20°, and wherein the LEDs can be coloured and the light intensity thereof is adjustable.

10 33. Method for manufacturing a videophone as claimed in any of the claims 28-32, wherein the operating means comprise a remote control for remotely controlling the videophone via a wire or in wireless manner.

34. Method for manufacturing a videophone as claimed in 15 any of the claims 28-33, wherein the reflection means have a tapering form so that the reflection means are narrower on the underside thereof than on the top side in order to improve the perspective view of the reflected image.

35. Method for manufacturing a videophone as claimed in 20 any of the claims 28-34, wherein the edge of the reflection means is made at least partially transparent in order to create virtual presence of the reflected image.

36. Method for manufacturing a videophone substantially as claimed in any of the claims 1-27.

25 37. Method for remotely actuating a videophone as claimed in any of the claims 1-27 with a palmtop or similar device.

38. Method for bringing to eye level a reflected image of a videophone as claimed in any of the claims 1-27 using a motor.

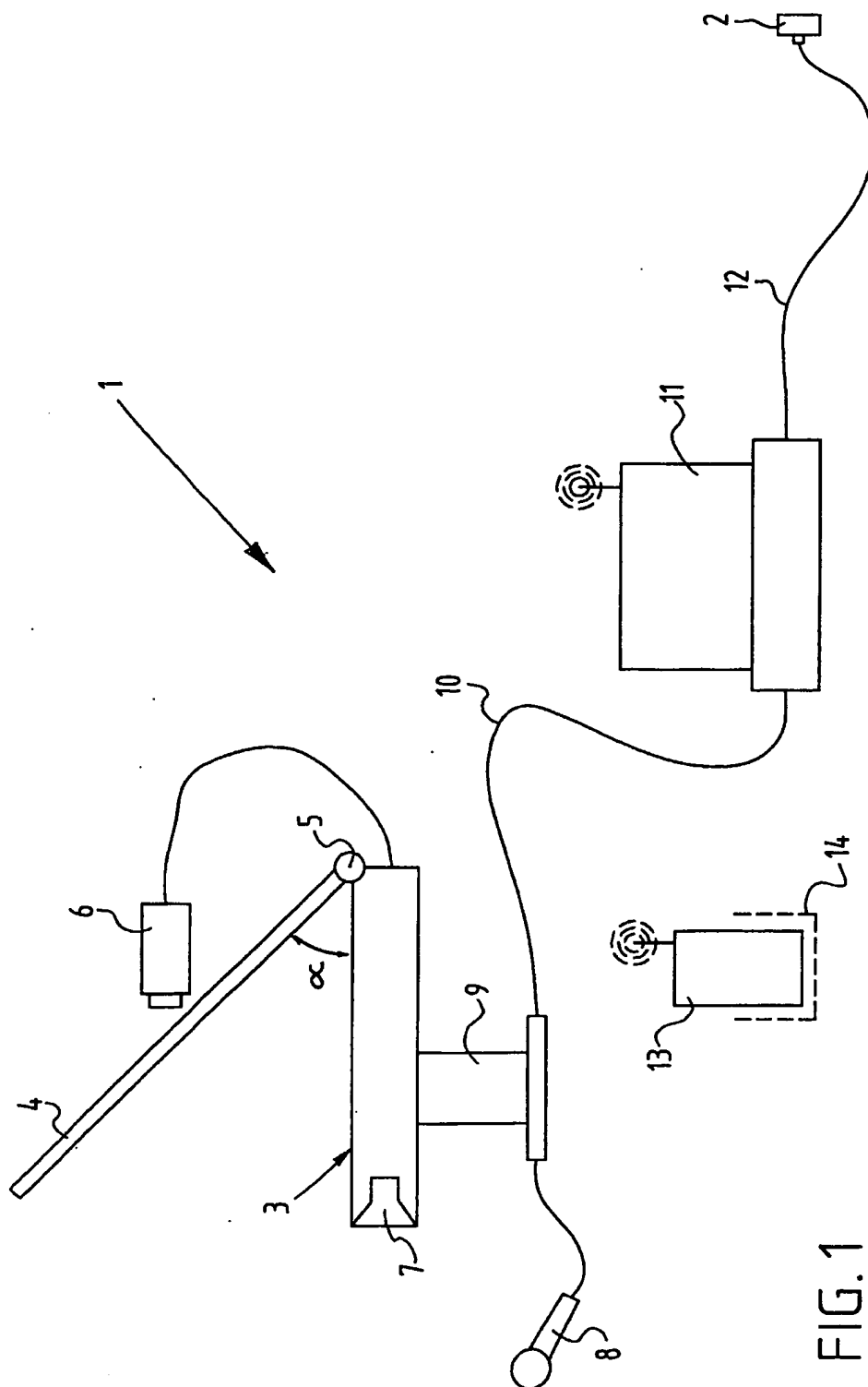


FIG. 1

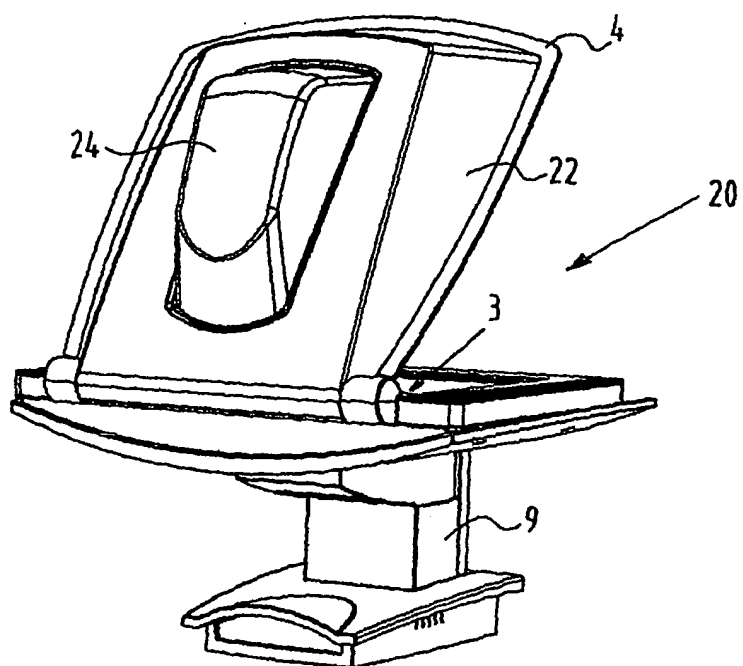


FIG. 2

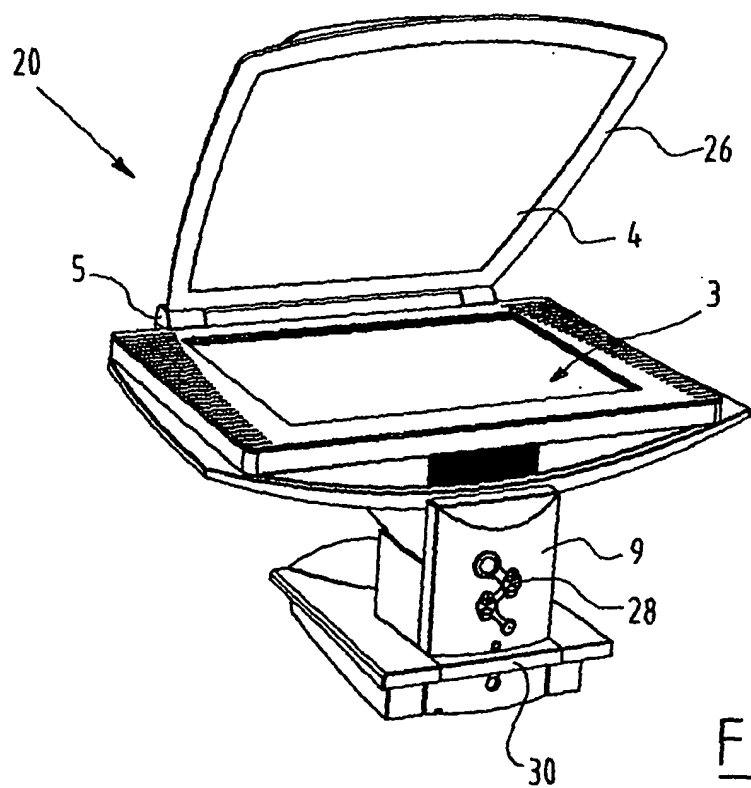


FIG. 3

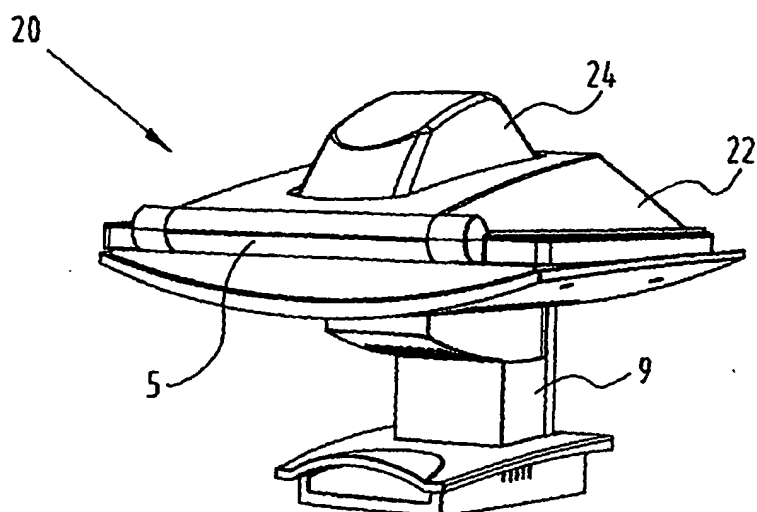


FIG. 4

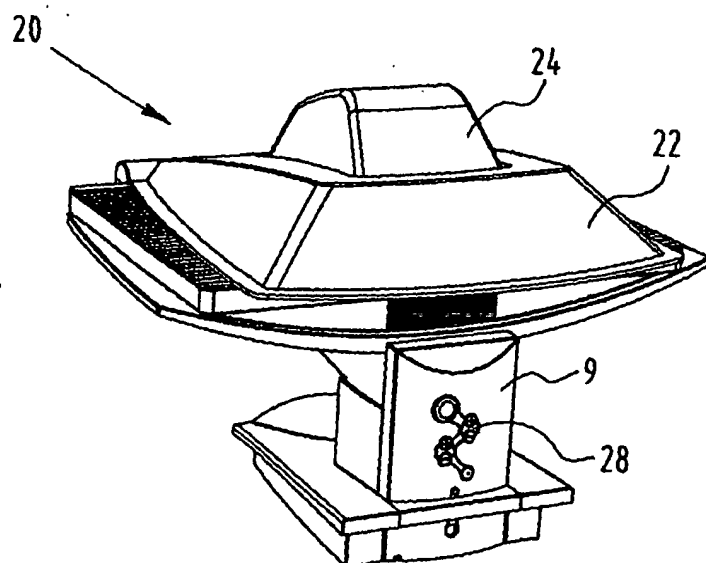
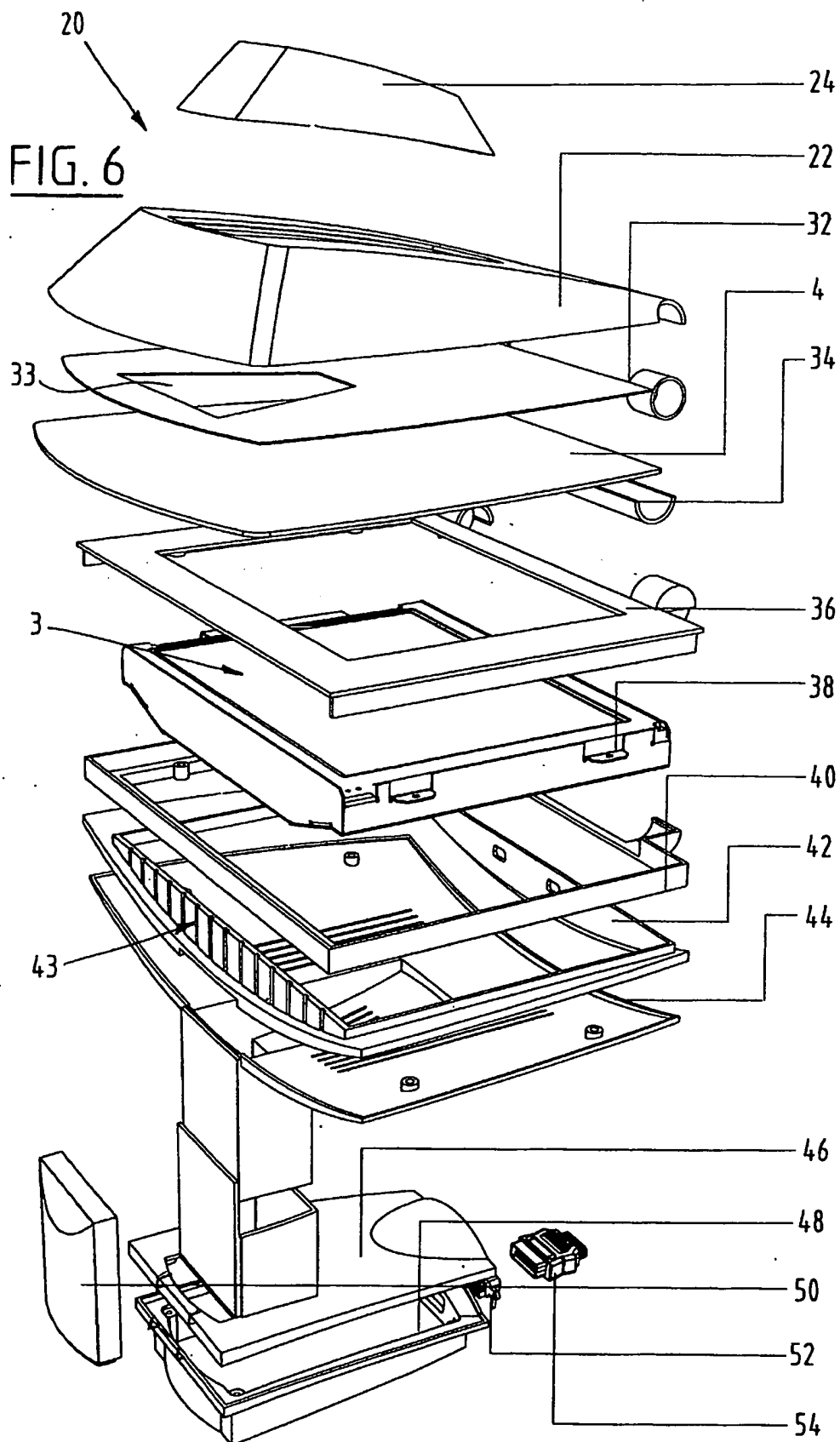
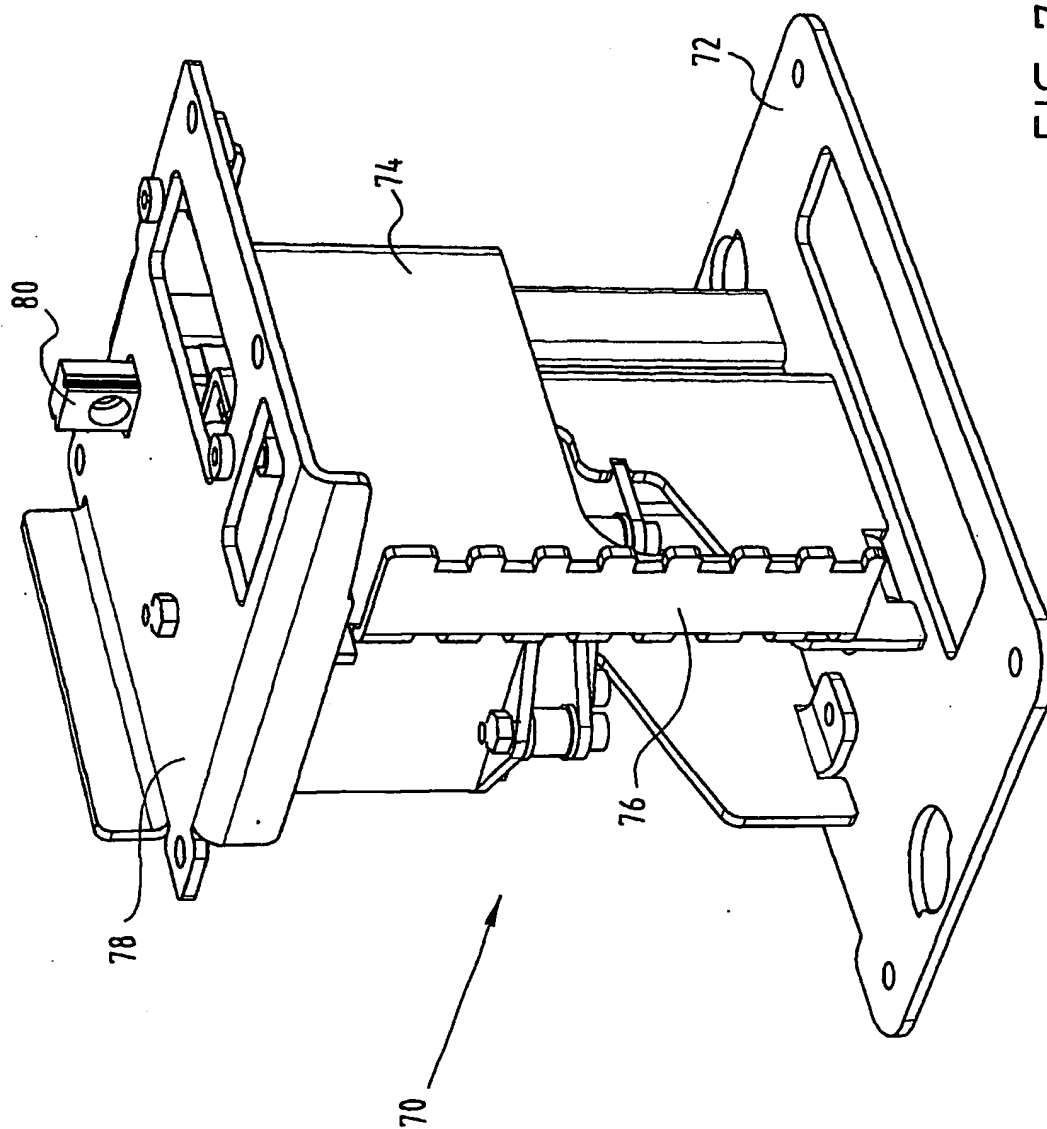


FIG. 5





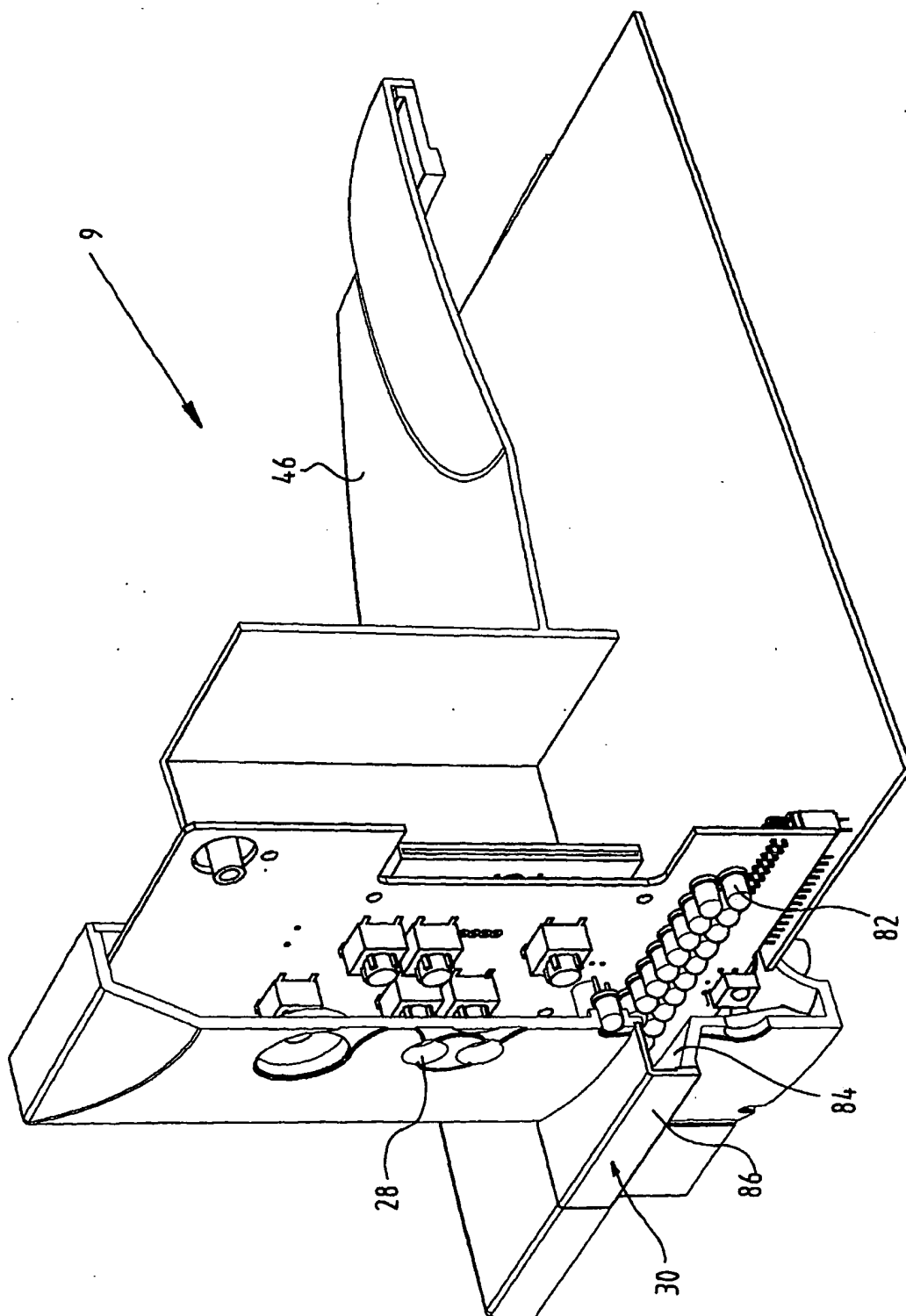


FIG. 8

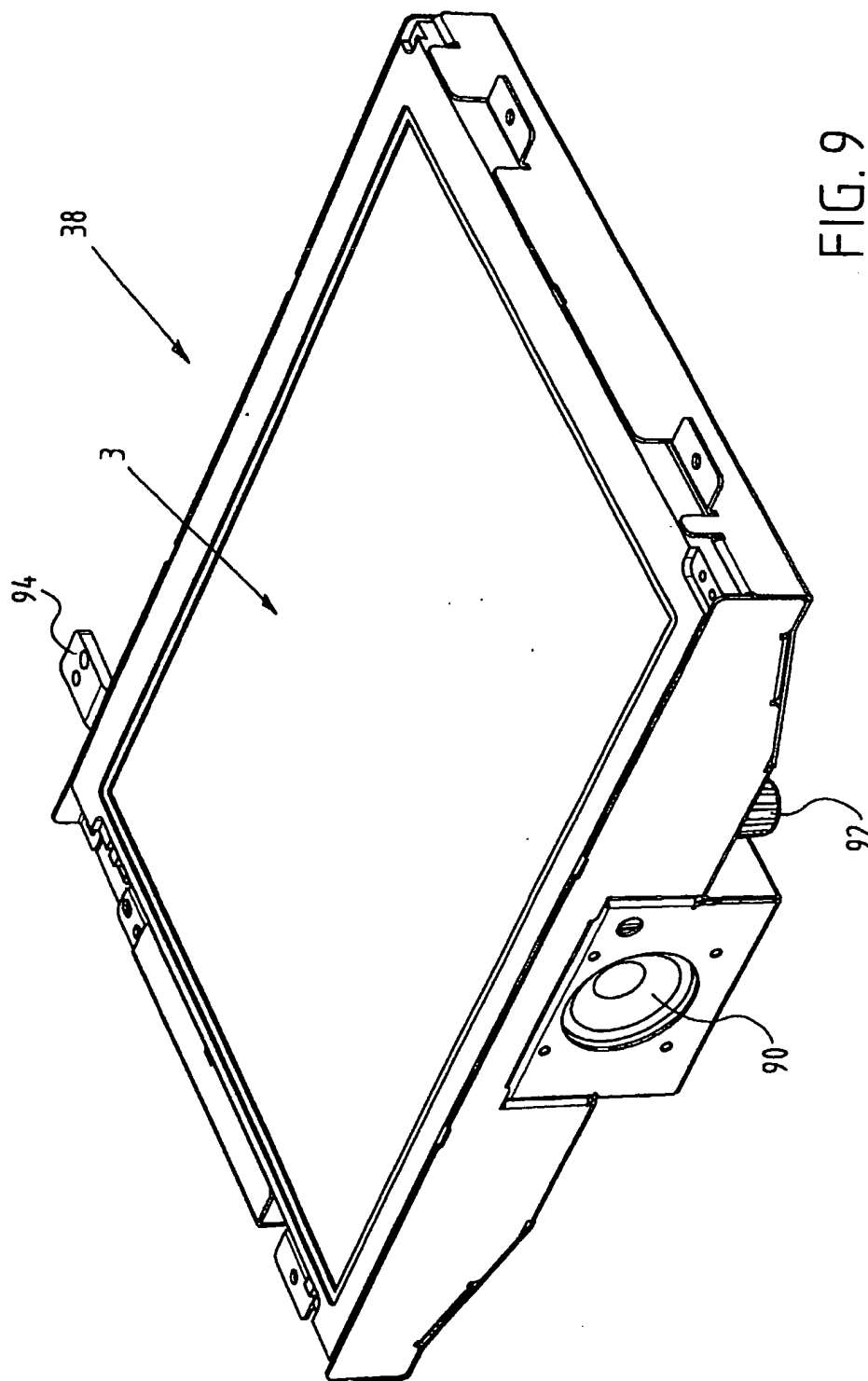
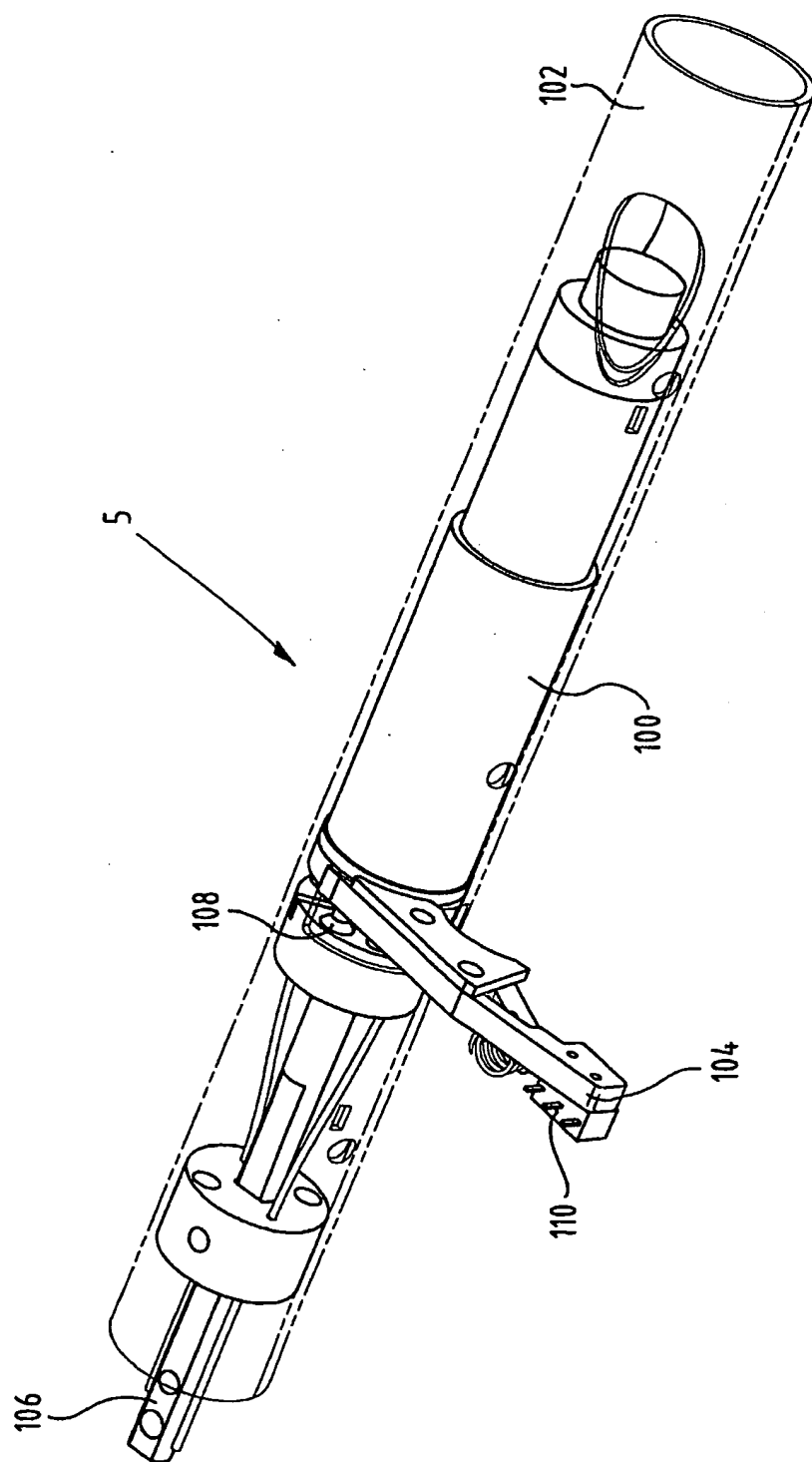
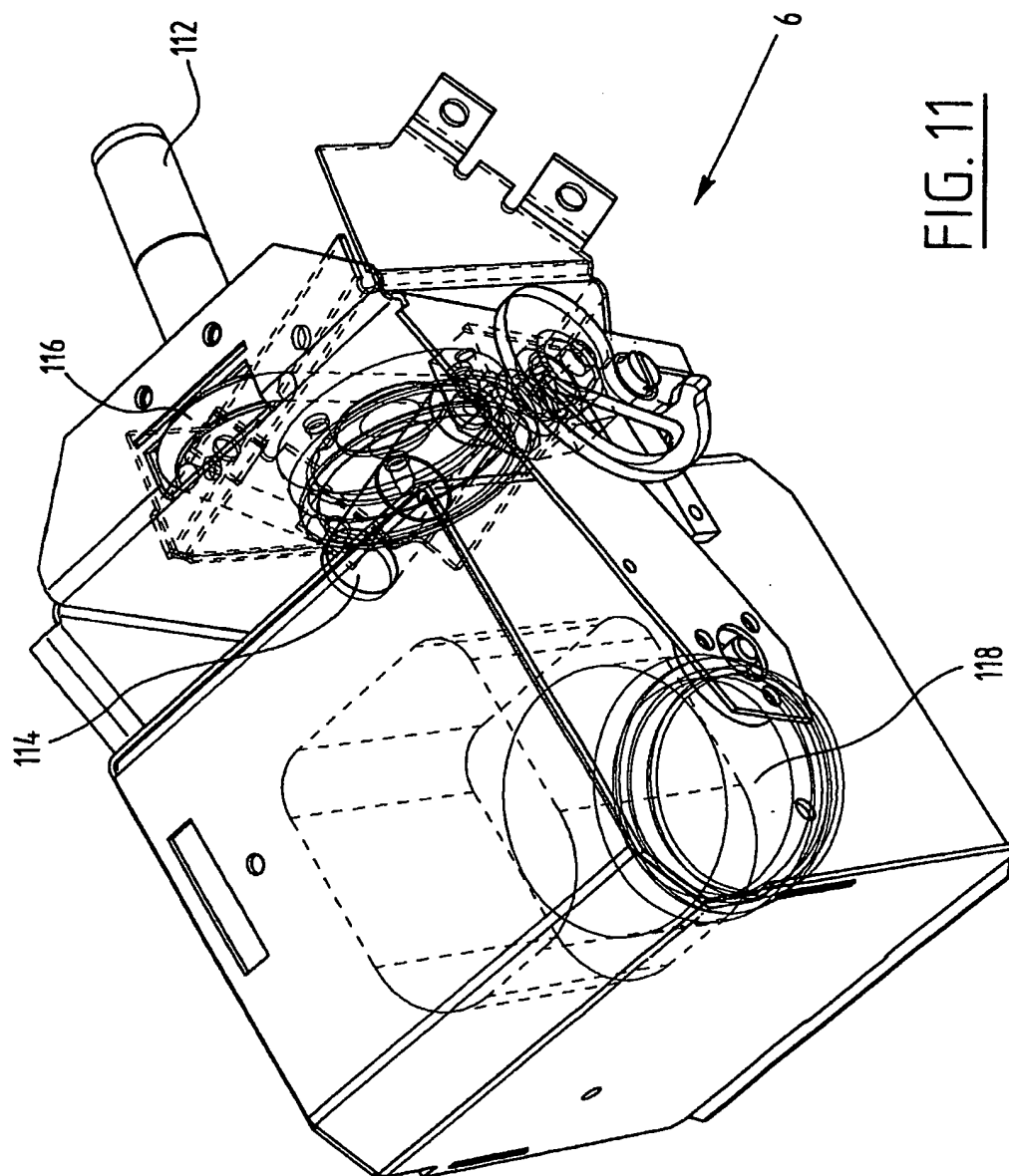
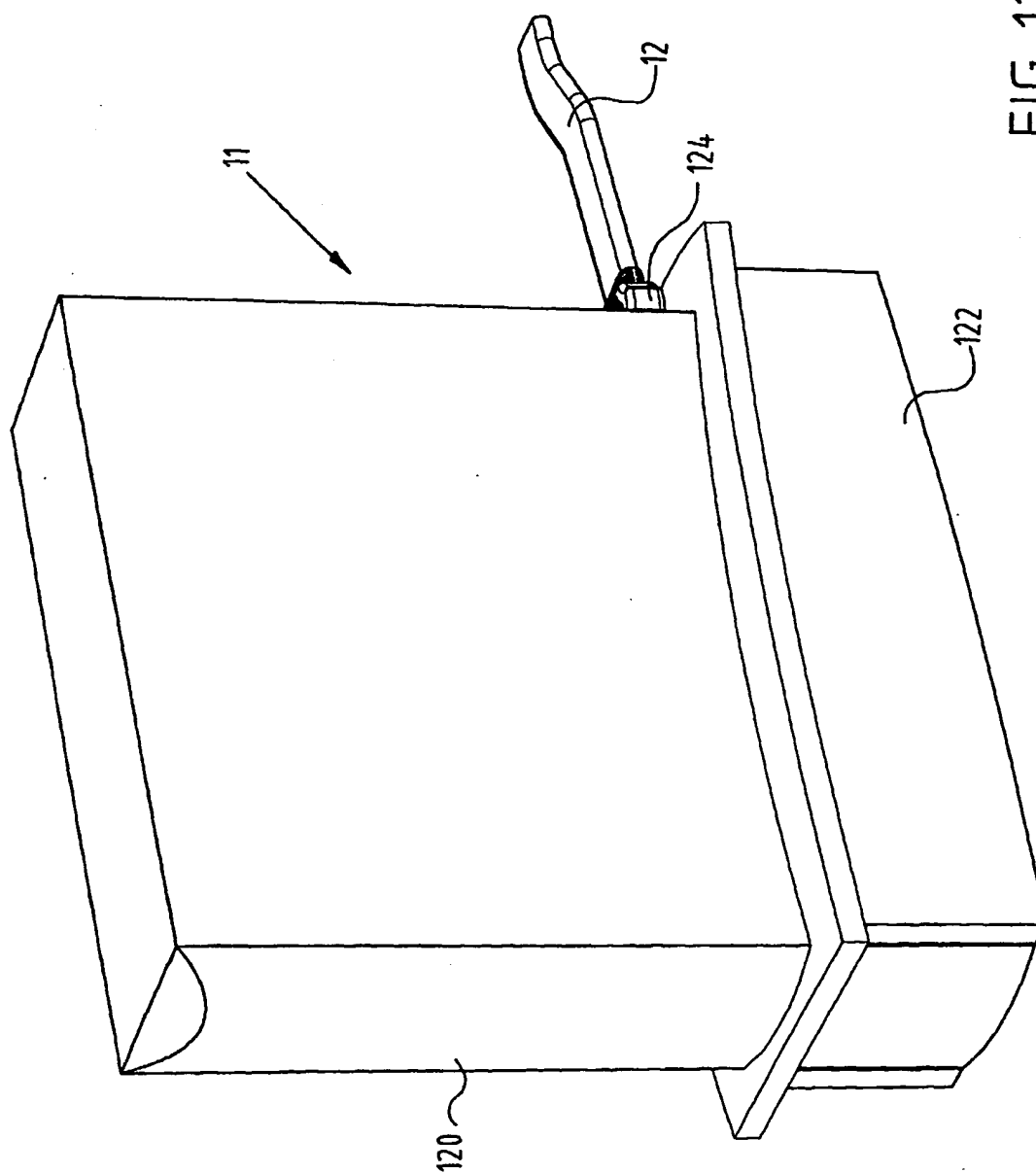


FIG. 9

FIG. 10



FIG. 12

INTERNATIONAL SEARCH REPORT

International application No

PCT/NL 02/00767

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04N7/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 777 665 A (MCNELLY STEVE H. ET AL) 7 July 1998 (1998-07-07) cited in the application	1,2,5, 11,15, 16, 19-21, 23,28, 29,31,36
Y	column 4, line 35 -column 9, line 9 figures 4-14	3,4,30, 38
Y	US 5 194 955 A (YONETA HAJIME ET AL) 16 March 1993 (1993-03-16) column 3, line 14 - line 46 figure 1	3,4,30, 38

☐ Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents:

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Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Van der Zaai, R

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